SUPPLEMENT.

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

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NT MEETINGS OF ENGINEERS AND SHIPBUILDERS AT GLASGOW.

EXPANSIVE DOUBLE-CYLINDER PUMPING-ENGINE.

. ANDREW BARCLAY read the next paper, which dealt with the e subject. The question of raising water from deep mines was, id, one which had engaged the attention of engineers from the est times—indeed, it was to the difficulties experienced in effect- hat object, and the absolute necessity of accomplishing it that were indebted for the invention of the steam-engine itself. The ovement which he intended to effect on the pumping-engine was lopt a double cylinder, which had been found so efficient for purposes, and was now so successfully used as a marine engine lessrs. Randolph, Elder, and Co., and others, and to dispense the ponderous walking-beam, and, consequently, the expensive dations and house required for it, and to substitute in its stead erhanging lifting-beam, such as he had already successfully ap- l in many parts of the country to single-cylinder engines. He aware that double-cylinder pumping-engines had already been tried by than one party, but some of them were very rude structures, and all of had the objectionable beam and its necessary expensive buildings. The ple of the engine was to admit high-pressure steam from the boiler small cylinder, where it gave its direct power, after exerting which it into a large cylinder, and utilised the expansive power still left in the . In the marine or ordinary land-engine fitted with double cylinders that ion went on at both ends of the cylinders, the steam which had done n the bottom of the piston in the small cylinder passing to the bottom of ston in the large cylinder, and the steam which had done duty at the of the piston in the small cylinder passing to the top of the piston in rge cylinder, and so on alternately. But, as the pumping-engine was only ed to do duty in one direction, the arrangement was somewhat different. he steam was first admitted to the bottom of the small cylinder; when ston had reached the top of the stroke the same steam was admitted at p of the same cylinder. The engine, being then in equilibrio, descended ts own gravity. When the piston had reached the bottom of the stroke am was all in the the top side of the small cylinder. It was then ad- under the piston of the large cylinder, where it acted with its expansive At the same time fresh steam from the boiler was admitted under the of the small cylinder. The reader now followed the steam as it passed e boiler to the bottom of the small cylinder, thence to the top of the ylinder, thence to the bottom of the large cylinder, thence to the top of ge cylinder, and finally to the condenser. One effect of the overhanging which was one of the chief peculiarities of the engine, was to increase ke from 10 ft. in the large cylinder and 7 ft. 9½ in. in the small one, to the pumps. But what it principally effected was that it dispensed in measure with the massive beam and masonry required to carry the beam er parts of the Cornish engine, the force of the steam being exerted in only.

STEVENSON (Airdrie) remarked that with the bell-crank ar- ment they had work doing throughout the entire length of the . Mr. Barclay appeared to think that it would be better to e momentum into the fly-wheel instead of the piston, but there certain limit of speed. It was absurd to talk about getting ylinder with a piston-rod of 80 ft. per minute, whilst the ave- as 950 ft. per minute. This was an objection he had called on to in the Cornish engine, as well as in the engine of Mr. y. He thought the latter engine possessed some great ad- ges, and it was just as good as the Cornish engine, but no It was, perhaps, better, inasmuch as it was cheaper, but it fective, the piston-speed being much slower than in the Cor- gine, on account of the leverage, which claimed to be an ad- e. It was, perhaps, an advantage in respect that it gave more n at the pit mouth, more convenience for working the pumps, e general arrangement of the pit, but in respect that the stroke pump was greater than the stroke of the piston, it was so much han the Cornish engine. Mr. Barclay had assumed that the ngine ought to do work only at one part of the stroke. What was there for this? Why should the time of the piston in ing be lost? This was one of the great advantages of the nk arrangement. The only object of the arrangement was omething like a proper speed in the piston. Even with the they could add to the bell-crank they could not get anything minimum speed of over 250 ft. per minute. Mr. Barclay had d that the compound engine possessed many advantages over gle engine. He (Mr. Stevenson) did not dispute that there dvantages connected with the marine compound engine. But ld like to know where the great advantage of the compound was for this purpose. Could work not be as economically ith the one cylinder? Mr. Barclay said the pressure was more n with the two cylinders; but he (Mr. Stevenson) thought that e amount of expansion could be got with the one cylinder as o.—Mr. BARCLAY said he would not be afraid to offer to e Cornish engine if they allowed him to put on an expansive lve, to make it condensing, to check the cylinders, and cover oilers.

TEVENSON (Airdrie): If Mr. Barclay would lengthen the end bell-crank he would beat it a great deal further.

OHN COOKE (Darlington) asked Mr. Barclay how much clear- e proposed to have between the piston at the top of its stroke e cylinder cover; and how much space was there between the and the bottom of the cylinder?—Mr. BARCLAY: Just the s in the ordinary engine. There is no more required.

AN EXPANSIVE CUT-OFF SLIDE-VALVE.

A. BARCLAY next brought under the notice of the meeting an ive cut-off slide-valve. He exhibited a full-sized model of a ngine. The front valve, he explained, had 2½ in. of travel, back valve 4 in. The port in the front valve is a little wider than the the cylinder, to allow the valve to have more travel, as in high cutting valves are moving in opposite directions, and, consequently, cut off The valve is full open by the time the piston travels 1¾ in., it remains for the next 2¼ in., and it is shut off while the piston travels 1 in. A lve would not fall as fast. Mr. Barclay's purpose in bringing the valve e notice of the meeting was to show that they did not require to adopt valves or Corliss valves to get the full benefit of expansion, as cutting e done to perfection by a simple modification of the common slide- hich, in practice, has been found by far the most simple and the least derangement of all the valves which have hitherto been tried.

PRESIDENT, in thanking Mr. Barclay for his paper, remarked afforded another evidence that the reading of papers in a like that elicits information, introduces new improvements, veys and checks the detailed observations of every gentleman ed, while it also, he thought, showed the truth of an obser- e had made on the preceding day—that one of the advan- societies like that meeting together was a comparison of The President concluded by asking the next speaker to make r as brief as possible, on account of the day being so far ad-

ON A NEW COAL-GETTING MACHINE.

Mr. GEORGE SIMPSON, who was called on to read the next paper, on a new coal-getting machine, promised to make his remarks as brief as possible. He said the pumping and winding machinery of many of our Scotch collieries might be considered as in a fair state of efficiency for the purposes intended, but the same thing cannot be said with regard to underground transit machinery. With the exception of dock engines, and one or two partial attempts at general transit, this branch of colliery mechanism had been altogether neglected. It was difficult to account for this, as the impediments to be overcome were not such as to prevent the successful superseding of manual labour in drawing or conveying the materials. This most desirable result could not be too soon accomplished, especially as regards youths now employed as drawers, who should be at school. The chief obstacles to the successful application of machinery for excavating, or what was technically called getting, coal or other minerals were the ever-varying state of the mine, irregularities of the seam and accompanying strata, want of room in their seams, brittleness of roof in both thin and thick seams, and adaptations of power to meet the varying circumstances under which the minerals were developed. It was not necessary that getting machinery should be constructed to meet the present modes of working minerals, or to suit the systems of ventilation in practice, or that the motor, as had been done hitherto, should accompany the excavator. In endeavouring to fix on machinery to supersede the most labourious part of the miners' work—holing or undermining the seam—one is naturally led to follow the action of his pick. Whilst doing so it would be observed that a considerable portion of his energy was necessary to maintain his pick in a horizontal position. This prevented him from developing his full force in the blow, and resulted in reducing his eight hours' labour in holing to about 540,000 foot pounds, or in hard coal to about 36 square feet per shift. After going somewhat into the results of working coal, the writer proceeded to describe his new machine. Any number of these machines might, he said, be used without interfering with the ventilation of the mine, and intervening blowing or pumping machinery might be dispensed with. It was expected also that breakages at present arising from the complicated nature of the existing machines would be almost entirely avoided.

In reply to the President, Mr. SIMPSON described his machine as exhibited. He said that the model represented the power fixed while the excavator traversed along the face. The power was a chain parallel to the face, varying from 4 to 10 yards, in cundies, and the right angle chain or rope was along the drawing-rod from the main chain or rope, to the machine at the face. The main chain was transferred onward, from time to time, as the work was progressed.

In answer to Mr. Lupton, Mr. SIMPSON stated that it was by percussion, and not by the air, that the machine was made to work.

The PRESIDENT, in moving the thanks of the meeting to Mr. Simpson, stated that gentlemen employed in the economical working of coal were induced by such discussions as this to turn their attention to new works. The British Association was only another instance of their meetings there to-day. They proposed to be the scouts to prepare the way of reducing the difficulties in the path of science, and whether or not Mr. Simpson's plan was perfectly matured, they would join in thanking him for the nice idea he had brought before them.

THE UTILISATION OF BLAST-FURNACE GASES.

Mr. WILLIAM FERRIE read a paper on this subject. The reader set out by noticing that the utilisation of gases for our blast-furnaces had for many years attracted the attention of ironmasters. In the Cleveland districts, where coke was the fuel used, the collection and consumption of those gases had arrived to a high degree of perfection, and without which it was questionable whether the Middlesborough iron trade would have reached its present magnitude. In districts where raw fuel is used nothing satisfactory could be stated of the results obtained. The practice was chiefly confined to works where the produce of the furnaces was forge iron, and at such works it was found that the advantages, if any, gained by the consumption of the gases were not worth the trouble of adapting works to make use of them. Twenty years ago most of the leading Scotch firms succeeded in withdrawing the gases in the furnaces, using them in heaters, and raising steam; but those advantages were far more than counterbalanced by the irregularities of the furnaces, and the incapability of producing quantity and quality of iron. The result of the experience, then, of withdrawing gases from a furnace using raw coal as a fuel was that the temperature was reduced, that the produce decreased, and that the iron made was more uniformly forge or No. 4, than No. 1 or No. 3, results the very reverse of those wanted. The Scotch ironmaster's object and interest was to produce No. 1 pig-iron, the price of that quality being from 2s. to sometimes 10s. per ton above No. 3 in the market; and as a rule, therefore, every effort was made to regulate the burden of the furnaces to produce that quality of iron. In fact, the manufacture of No. 1 pig-iron to the Scotch ironmasters was a *sine qua non*, for upon it his status—he (the writer) might say his existence—in the trade chiefly depended; so that unless a plan for the utilisation of the gases could be introduced which would enable him to produce pig-iron as he did now, there was little hope of seeing in general use the blast-furnace gases as heat-producers. It had been said, and he believed the assertion was not far from being true, that a Scotch furnace sent twice as much unconsumed fuel up into the air as was consumed within it—a prodigality in the waste of useful products which apparently evinced want of skill in their management. It would be admitted that the real difficulty in withdrawing gases from a furnaces using raw coal as fuel was that the combination of the gases at the furnace top was the means whereby the coal was converted into coke, in which state it must be previous to its descent to the zone of reduction. That the gases were in excess of what was required for the coking process was beyond doubt, but to regulate the withdrawal of them so as not to interfere with the regular working of the furnace has never been done, so far as the writer knew, satisfactorily. The saving of fuel would be enormous if a practical plan could be introduced to admit of the withdrawal of the gases. To the withdrawal of gases from the blast-furnaces he had for some time paid particular attention, and it occurred to him that if they could coke coal in furnaces in the same manner as it was coked in common retorts at gas works the difficulty of withdrawing the gases would be overcome; and, in the hope that he had hit upon the right road to success, he commenced experiments with a small blast-furnace, about the fifteenth capacity of a 50-ft. furnace. The gases passed off into a main, which communicated with the entrance of the flues at the bottom of the retorts, and were then ignited by the aid of atmospheric air. Those flues were spiral, in order that the heat from the burning gases might permeate the materials inside of the retorts, and had a termination for the exhaust gases by chimneys at the top of the retorts. That furnace was carried on for about two months, with raw coal as fuel, and the results obtained were highly satisfactory. The iron produced was No. 1, No. 3, and No. 4, and that from materials that had only been 16 hours in the furnace, such was the rapidity of the driving of the furnace. An examination was daily made of the interior of the furnace, at the bottom of the retorts, and invariably the coal was found thoroughly coked and at full heat, the lime completely calcined at the same temperature, and at a like temperature also were the ores. Being convinced that plan of working a furnace was practicable, one of the furnaces at the writer's (Monkland) works was immediately altered on the same plan, or nearly so, and would be in operation about the end of this month. Mr. Ferrie referred to another modification of a self-acting coking furnace. The throat of it was contracted in diameter, whilst of a proportionately increased vertical length, so as to form a single retort, which was heated by burning gases surrounding it, much in the same way as in the furnace he had just described. In working this furnace, to which he was now referring, he proposed to introduce a portion only of the coal, or it might be coke, into the central retort along with the ores. The retorts at the outside of the lining were to receive the remainder of coal, which became coked in descending the retorts, which were heated by burning gases in flues surrounding them. Those retorts were continued downwards separately from the central part of the furnace nearly to the hearth, so as to keep their contents distinct, and to insure the coke formed in them being interposed at the hearth between the ores, or metal, and the blast jets. According to the opinion of chemists, the air when blown into the furnace was changed into carbonic acid gas, and immediately thereafter the gas was changed into carbonic oxide, by coming into contact with red-hot coke, and this latter gas was the power used in smelting. It would appear, therefore, in order to have regularity in the production of carbonic oxide, that a layer of coke should interpose as constantly as possible between the blast and the ores. In blast-furnaces, as now charged, that was not so. That plan of furnace was intended to counteract the irregularities referred to, by having at all times coke between the blast and the ores, and he anticipated from such an arrangement an increase in the production of carbonic oxide, a regularity in the smelting-furnace, and a saving of fuel. He could not say anything of the results that would be got from such a furnace, owing to not having an opportunity of putting it in practice. He was at present altering an experimental furnace, with the view of trying it, and he hoped at some future meeting to give them the results of his experiments.

The PRESIDENT asked Mr. Ferrie if he had any experiments showing the comparative quantity of coal used in each case?—Mr. FERRIE said that the furnaces were so small, that any results that could be got were not to be relied upon.

Mr. KOHN (Glasgow) said that as the ordinary furnace had by its own construction a tendency to put itself right, he would ask Mr. Ferrie whether he had any artificial means to make his furnace work itself right?—Mr. FERRIE said that this had not yet been practically tried. He might be able to state the results to a future meeting, but at present the matter was in too crude a state for him to do so.

ON CERTAIN PROPOSED IMPROVEMENTS IN THE MANUFACTURE OF HYDRO-CARBON OILS.

Mr. DAVID COWAN read the next paper on the subject stated above. He said—The importance to which the manufacture of mineral oils has attained during the past few years is such as to give it a place among our leading local industries. The oil-yielding materials—that is, the bitumenous shales and the cannel coals—are plentifully distributed throughout the whole of the Scottish coal measures, but differ very much in character, both as regards the quantity and the quality of produce. To obtain oils from these materials, they are, first, subjected to a process of destructive distilation, which forms the oils, during which they escape in the form of vapour, while the fixed carbon remains with the ash in the distilling vessel or retort. The economy and efficiency of this operation depends greatly upon the kind of retort, the system of heating adopted, the degree of heat applied, and the efficiency of the condensing part of the apparatus. Various forms and arrangements of retorts have been tried from time to time with more or less success, but full descriptions of all the retorts and ovens that have been tried is not contemplated in this paper. The retorts used in this district belong to either one or other of two types—the horizontal and the vertical. The horizontal retort is usually rectangular or elliptical in cross section, and varies from 30 to 60 in. in width, and from 8 to 10 ft. in length. They are built in brickwork, and are heated, charged, and emptied much in the same way as the retorts used in the manufacture of coal gas—only a much lower degree of heat is applied. The vertical retort usually consists of an upright cylinder, fitted at the top with a hopper and bell-cone, charging apparatus similar to that used on a close-topped blast-furnace. The lower end dips into a trough of water, which while it admits of the exhausted materials being withdrawn there, prevents the escape of the hydro-carbon vapour, and also the entrance of air into the retort. It is proposed in this paper—first, to consider the advantages and disadvantages of each of these classes of retorts, and afterwards to describe an arrangement of apparatus designed to combine the advantages of both, and which at the same time will admit of improved facilities for working. In horizontal retorts the depth of the charge of material is very much less than a vertical retorts, and the passage of the oil vapour through the material to the surface is, therefore, comparatively easy. The outlet pipes are generally at the end of the retort furthest from the furnace, and should be upon a level with the upper part of the material of the charge, and the unobstructed vapour escapes freely, which is greatly conducive to a good yield as well as to a good quality of oil. The vertical retort is generally about 10 ft. in height, and is completely filled with shale up to the mouth of the discharge pipe. The passage of the vapour from the lower portion of the retort is considerably obstructed by having to pass through such a depth of material, and there is much loss by condensation in the upper part of the retort before the vapours reach the exit pipe, and in consequence of the condensation the vapour falls down into a hot part of the retort, and is again exposed to a temperature equal to that at which it was formed, and partly decomposes, and is deprived of a portion of its hydrogen. There is thus caused a deterioration of the quality and a diminution of the quantity of light or burning oil. Altogether the oils from these vertical retorts are of inferior quality, as compared with the produce of horizontal retorts, while the quantity of uncondensable or permanent gas is increased. The work of charging and discharging these retorts is, however, considerably less. The arrangement herein to be proposed and described belongs to the vertical class, with improvements calculated to remedy the evils we have been describing as attaching to them. The writer went on to illustrate by a series of diagrams the operation of the retort, which was charged from the top, the bitumenous materials in small pieces being put into the annular spaces between the grating and the inside. When heated to a proper temperature—say, between 700° and 800° Fahr.—hydro-carbon vapours are formed and given off. These find their way into the grating pipe—the coolest part of the retort—and when assisted by the exhausting fan will speedily find their way through the eduction pipes into the condensers. Thus the thickness of shale through which any of the vapours must pass before reaching the outlet pipe is only the width of the annular space—say, 8 in. In this form of retort the vapour does not require to ascend at all, and although it may partially condense within it cannot return to the hottest part, but must pass downwards towards the condensers, and, therefore, whatever loss is due to the decomposition which is usual from this cause will in a great measure be saved. It appears to the writer that another important improvement may be effected in the way of heating or firing the retorts. In heating them by ordinary coal-burning furnaces, constant, regular, and watchful attention to the condition of the fires is required. The regular maintenance of the proper temperature may be said to embrace the whole of the skill required for distilling crude hydro-carbon oils. It has occurred to the writer that, instead of firing with coal, the retorts should be heated with gas flame, as, besides economising fuel and labour, it will meet the requirements of regularity and watchfulness more satifactorily than the present system, as when once the gas is lighted and the flame adjusted, further attention will be unnecessary. It is here suggested that the system of first converting the fuel into gas (so successfully worked out by Siemens) should be adopted, and the drawings show generally how such a system can be applied. They also show the arrangement of the flues, and indicate the direction of the currents. Inspection will show that the air necessary for supporting combustion will be heated previous to entering the furnace. This mode of heating by gas instead of by solid fuel, and with hot air supplied to the furnaces, should, beside the more important advantage of regular temperature, effect a saving of from 40 to 50 per cent. of fuel. The author has also directed his attention towards economising the labour required for charging and discharging these retorts, and with this object in view he has designed an arrangement of machinery for serving the materials to the retorts, as shown in the drawings. In describing the action of the machinery, the steam-engine used for working the pump and fan would communicate motion to the end pulley or wheel. The motion should be adjusted so that the chain will be moved over the pulleys at a speed of about three miles an hour. The empty buckets as they reach the loading bench, on a level with the surface, are filled with material, and are afterwards carried by the moving chain upwards and along above the top of the retorts; and at whatever bench it is desired to empty these buckets a pin is to be inserted into the eye-hole formed in the arms V V, which engages the arms U U on the bucket, and tilts it in the manner shown on the drawing. When emptied, these buckets immediately right themselves, pass onwards and round the far end wheels, and return to the top line of chain, to be again filled at the loading bench. The mineral, when deposited on the top of the benches, can be conveniently raked into the mouths of the retorts, or may be so arranged as to empty direct into the retorts. The same apparatus will convey the coal drop to the gas generators. This machinery might be simplified by using only one endless chain, or by adopting a modification of the wire tramways; but the arrangement here proposed is preferred where large quantities of materials require to be operated upon. The drawings show a tramway laid along the front of the retorts, which is provided with turn-tables for running small wagons into openings, W W, which are formed in the backwork underneath them. The cotters which secure the bottom covers are withdrawn, by a portable screw apparatus, worked from the outside. The bottom then falls down, and the exhausted shale empties out of the retorts into the wagons underneath, by which it is conveyed to the refuse heap. Thus the work of charging and discharging is reduced to a minimum. The arrangement for discharging the retorts is as follows:—Each pair of retorts are connected at the bottom by a horizontal tube,

on which are cast two brass sockets or faucets, for receiving the bottom ends of the retorts. The ends are closed by covers, one of which is a fixture, and is provided in the centre with a stuffing-box. The other centre can be removed at pleasure. A shaft is fixed along the axial line of this horizontal cylinder, on which is fixed two screen blades, one under each retort. These are revolved by suitable gearing, and will discharge the spent materials into a small wagon, resting on the tramway in front of the benches. This would be a more expensive arrangement, but the advantage which it has over that previously noticed is that the shale is discharged in front instead of underneath, and that the workmen will not be so much exposed to the noxious gas which is discharged from the used-up materials. A simple defective stop-valve for fitting on to the eduction pipes is also much wanted in mineral oil works. The majority of such valves in use are either plug-valves or hydraulic cup-valves, worked by a rod passing through a packing box in the valve chest cover. Plugs are seldom tight, and generally there is also a leakage from packing boxes. Cup-valves are always tight in themselves, but still they are liable to leak at the stuffing boxes. The condensers are riveted sheet-iron tubes, about 15 ft. long and 2 ft. in diameter, placed upright in a wall of brickwork, and have a central tube running throughout their entire length. The annular space between the outside and inside tubes should not exceed 3 in. in width. The joints which connect the gas and oil exit pipes are all secured by hydraulic seals, and provision is made for maintaining a constant depth of the sealing liquid around them. The oil main is placed underneath the condensers, and rests in a niche formed in the supporting wall. A 2-in. pipe runs along the bottom of this oil main, into which hot water or steam from the engine boiler can be poured at pleasure. This completes the description of the arrangement of plant which form the subject of this paper. The details have not been minutely gone into, all that was intended being merely a general description of the modifications proposed, and this may be sufficient to induce discussion, and be the means of directing further attention to this object on the part of our Institution.

The PRESIDENT remarked that this was a process which would be further investigated as the mineral oil supplies from America became exhausted. He did not think that they would be everlasting, although those supplies seemed a process of nature almost beyond their comprehension. Therefore it was wise in Mr. Cowan to take the precaution to make those materials useful in his own country which may require to supersede those which were so necessary in America at this moment. He could not separate from the meeting without asking the members of the United Societies of Mining and Mechanical Engineers to join him in a vote of sincere thanks to the gentlemen who had so handsomely and so elegantly entertained them. They had had an enormous establishment devoted to their use and benefit, and every society, every manufacture, and every place of interest in the whole district had been open to their view. He regretted that so few gentlemen from the North of England had taken advantage of that opportunity. When they returned to their own district, and gave in their report, he believed that many gentlemen would feel regret that they were not present.

Mr. DAVID ROWAN (President of the Institution of Engineers and Shipbuilders in Scotland) expressed his gratification that the efforts of the society had met with the approval of their guests. They, as an institution, had not within themselves the means of doing all that had been done, but immediately they announced the intended visit to their friends, and especially the Lord Provost, they were received in the most kindly manner, and his lordship expressed his anxiety that they should all enjoy themselves in Glasgow. The gentlemen whose names were mentioned in the lists placed in the hands of the members were very anxious to show them every attention in examining and inspecting their works. He felt exceedingly happy that up to that time everything had gone so comfortably and so well, and he was sure that they would go equally well to the end. (Cheers.)

The meeting then broke up, and after partaking of luncheon the members started in three omnibuses for the inspection of works in different parts of the city.

The third day of the visit of the North of England Institute of Mining and Mechanical Engineers was devoted to the inspection of works at a distance from Glasgow. The President (Mr. Boyd) attended, per invitation, the annual inspection of the Clyde Lights by the River Commissioners; and members of the joint Institutes visited the following amongst other works—The Dumbarton Shipbuilding and Engineering Works, the Dennyston Forge, the Leven Bank Print Works, the Dalmonoch Print Works, the Almond Iron Works and Collieries, the Carron Iron Works, Glasgow Oil Company's Mineral Oil Works, West Calder Paraffin Light and Mineral Oil Works, Gartsherrie Iron Works—at the latter works coal-cutting machines were seen in operation—Summerlee Iron Works, Langloan Iron Works, Calder Iron Works, Carnbroe Iron Works, Mossend Iron Works, and Coltness Iron Works. At Coatbridge the long-wall system of coal getting was seen in operation. This machine, which is the invention of Mr. Alexander, the managing partner of the Gartsherrie Works, has been brought to a high degree of perfection. The chief feature is an endless chain, to which are attached seven strong cutting tools, which, by means of compressed air, are made to rotate, and in succession dig into and undercut the seam of coal. One of these machines, under the management of two men, can cut upwards of 30 yards an hour. The same party visited the Summerlee Iron Works, where they minutely examined the method adopted for heating the blast by means of the waste gas from the blast-furnaces.

Friday, the last day of the visit, was devoted to an excursion to Loch Lomond, per the steamer Chancellor. The trip was thoroughly enjoyed; and on Saturday the great bulk of the visitors left for home, the meeting having been very successful.

EXHIPITION OF MODELS, &c.

An exhibition of models, drawings, specimens of manufactures, minerals, and fossils took place in connection with the joint meetings. Some of the models were specially interesting, although few of them, if any, were of very recent date.

A PATENT ATMOSPHERIC HAMMER was examined with some curiosity. This is a very ingenious contrivance, being a sort of parody of the mechanism of the steam-hammer, but operating by gravitation like the ordinary pile-driving machine, and devised by Mr. W. Bowser and Co., Paisley-road. The hammer may be easily driven by a belt from ordinary shafting, or by manual labour, and should, therefore, prove a very convenient implement for a country smith where steam or water power are not at command. It is not a little singular that a hammer of this kind should, by a return in the path of invention, be made available to the displacement of the old water-driven tilt hammer, if such still exists. It is probable that Bowser's atmospheric hammer would not but for the steam-hammer ever have existed, but it suggests the use of water-power in lieu of steam whenever that cheap power can be procured, and in this facility of adaptation lies a good deal of the value of this invention to workers in iron.

NAPIER'S PATENT FRICTION CLUTCH is a clever invention. It combines all the properties of a clutch proper with those of a friction cone for limiting the amount of strain that can be transmitted through it, and the limit of this strain can be regulated either when in or out of gear by the turning of a single bolt. It operates with the utmost facility, whether adapted for driving heavy machinery, such as rolling-mills, and prevents all shocks to the connections, at whatever speed they may be driven. The example shown is above the scale of a mere model, being of serviceable size, and, therefore, more palpable in its mechanical properties.

An example of MOODIE'S HORIZONTAL PROPELLER excited some degree of attention. The paddles, which form the propeller, are three in number, mounted upon a vertical axis, and revolve with it, and they feather as they revolve. The paddle, when feathered, presents no resistance to the water, while the force of two of the paddles, at an angle of 45° each, strikes the water with a power equal to one of the paddles at 90°, or a maximum, causing the vessel to move ahead. The scheme has also adaptations for causing the vessel to back or to side with facility. The scheme promises well, and should prove a rival to the screw as a propeller.

Messrs. Thompson and Co. exhibited specimens of STEERING GEAR. Ten complete revolutions of the horizontal steering-wheel is needed to move the ship's helm through 90°, or a quadrant. Accordingly, the power which the combination gives to the steersman over the helm is as 40 to 1—prodigious mechanical advantage. Of course, in heavy weather, a sea striking the ship's rudder will propagate the concussion to the helmsman in the inverse proportion of 1 to 40 in his favour.

A machine for STRENGTHENING BARS engaged the interest of gentlemen who are employed in the manufactured iron trade. The principle of this machine, devised by Mr. James Robertson, of Stanley-street, Paisley-road, is so to operate on a bent bar by three equal and compensating pressures of enormous force as to deliver the bar, after being subjected to them, straight. Nor does it appear necessary that the opposite sides of the bar must be parallel, as the machine has an easy adaptation to such possible diversities of form.

Page's system of JOINING PIPES, which was likewise exhibited, provides for inequalities in the tube and its bed, with the certainty of securing a gas or a water-tight joint. Examples are shown of the method of articulating the parts together, and the composition used in the joints expands in setting, and when hard is capable of standing a pressure of 6000 lbs. to the square inch.

A new adaptation of FRESNIL'S SHIP LIGHTS was examined minutely. The merit of the contrivance consists in so confining and giving a specific limit and direction to the light developed within the rings as to realise on shipboard the full value of the illumination in the direction intended. The plan is the invention of Mr. Thomas Stevenson, C.E., of the Northern Lights, and the instrument is called "Stevenson's Azimuthal Condensing Apparatus for Ships' Side Lights." It is so contrived as to spread all the light emitted over an arc of 112½° in the horizontal plane, or from right ahead to two points abaft the beam. While the prismatic rings are horizontal in position, a combination of straight prisms, standing the full height of the lamp, are disposed, two on each side of the rings, so as to direct the light and spread it over the arc of illumination. By this arrangement an observer, at less than the distance of a ship's breadth, receives rays of light not only from the central apparatus, but also from these side prisms. The light, in a word, is sent out with much less spreading and with much less diminution of intensity than it otherwise would be. Its use should prove a great safety in navigation in preventing collisions. The light neither escapes to the clouds, nor is it lost in the sea, but strikes out from the plane of the ship's deck, and in the direction, mainly, of her motion, and over the breadth of her hull.

A number of interesting drawings and photographs of ships' machinery, &c., and different specimens of ironstone and fossils, were exhibited, and examined with interest.

Original Correspondence.

NOTES ON CONTINENTAL MINING—No. IX.

GERMAN SMELTING WORKS.

Nestling in the ravines of the Hartz, like the cotton-mills in the Lancashire valleys, are numerous smelting works. The frequent occurrence in the topographical terminology of blei, German for lead, and hütte, a smelting-house, as Silberhütte, Frederickshütte, indicates the antiquity of the industry. Among those we visited, the works at Frederickshütte, between Zellerfeld and Goslar, were examined most in detail. And we the more readily select this for description, in that we there witnessed the working of a process for desilverising lead, which, we were assured, is far in advance, both as regards the metal production and economy, of the Pattinson method, so universally adopted in England.

Although, as we have before intimated, there are serious objections against the Hanoverian system of working the mines and metal works directly by the State, yet there is this manifest gain, that each mine and works is able to secure a really skillful and scientific superintendence, which is more than can be said for many of our English mines. This arrangement results in a strong family likeness amongst all the mines and works, so that when one work has been examined, we find in the others precisely the same steady operations and the same stolid and enduring workmen. Each works seems to have been produced from exactly the same seed, and to differ only in the extent of its development, according to its locality and other conditions of growth. The general standard to which the ores are dressed is 75 per cent. Of this dressed ore, in the Zellerfeld Works, 66 per cent. is actually secured in metallic lead, while of the remaining 34 per cent., 13 represents sulphur, and the rest slags of the various other matters present in the original ore, and loss. These amounts are by no means patent to a cursory inspection, as the matters with which the furnaces are charged are of so varied a nature, consisting not only of the picked and sieve ore, but of the impure fine ore from the jigging-tubs and buddles, containing a considerable amount of siliceous matter, and of the various refuse matters from former operations, having very variable compositions.

The principle upon which the lead ores of the Hartz district are reduced is identical with the ordinary process for conducting a dry assay, and depends on the fact that iron has a greater affinity for sulphur than lead has; a sulphide of iron is, therefore, formed at the expense of the sulphur in the galena. The general form of furnace is a tall rectangular mass of masonry, of which the slightly hollowed hearth occupies only a small portion of about 3 feet. The hearth is gently inclined towards the front, to which place the melted matters flow, slag at the top and the metal underneath. A second and lower basin, communicating with the bottom of the slag hearth, receives the lead from time to time when the workman removes the plug. The blast is supplied by bellows worked by a water-wheel. The workmen pride themselves greatly on the skill with which, by regulating the blast, they can control the formation of a sort of slag-pipe that forms around the blast in the furnace, exactly like the incrustation that covers up the channel of liquid slag flowing from an ordinary iron blast-furnace. This slag-pipe, formed by the cooling effect of the blast upon the molten mass in the immediate neighbourhood of the tuyere is said to be of the greatest service in preventing the too energetic action of the blast on the ores at the tuyere end of the hearth.

The usual furnace charge at the Zellerfeld Works is in the following proportions. The amounts, as given by workmen at the smelting works have been supplemented by extracts from "Regnault's Chemistry:"—Sulphide of lead, a mixture of hand-picked, sieve, and smiddim ore, 37 cwts.; litharge, derived from cupellation, 6 cwts.; slags of mixed nature, 43 cwts.; cast-iron, 5 cwts. This mixture produces 24 cwts. of metallic lead. The greater portion is deposited in the receiving basin, directly from the first fusion; but about one-eighth of the above quantity is derived from subsequent operations on the slags and matts, in manner to be presently described. The object of so large a proportion of slag in the charge is to retard fusion until desulphurisation is pretty well advanced. Instead of the long chimney-flue adopted in English smelting works, these furnaces are furnished with a series of chambers, in which the lead vapour is condensed. These are periodically emptied by means of iron doors. The contents of the receiving basin in front of the lead furnace, to which we have already referred, readily separates into two portions, the lower one consisting of metallic lead, and the upper one chiefly of sulphide of iron, with a strong percentage of lead. This matt is allowed to accumulate until there is a sufficient quantity to calcine. It is then mixed in heaps, with alternate layers of fuel, and a slow combustion is carried on for from 20 to 25 days, during which time the sulphur is driven off as sulphurous acid. When the heap has burnt out it is carefully hand-picked, and those portions not completely desulphurised are set aside to be added to the next heap, and put through the same process again, while that part of the heap which is thoroughly calcined is removed to a small furnace, supplied with a good blast, where it is reduced in connection with slags and metallic iron. Here the same mixed product is obtained—metallic lead and a second matt. This matt is passed through the same roasting process, and the whole operation is repeated in the furnace until the fourth or fifth matt has become, through these successive concentrations, so rich in sulphide of copper as to be worth treatment for its extraction. In some of the Hartz works the lead is so rich in silver as to be cupelled at once. But in most cases the lead is desilverised by a process which was quite new to us, though we have since understood that the process has been tried by the Messrs. Neville and Co., at Llanelly. The lead, in ingots, is placed in a large cast-iron pot, similar to those used in the Pattinson process. When the lead is melted, and the refuse skimmed off, a quantity of melted zinc is added, equal to about 28 ozs. to each ounce of silver, as shown by assay to be present in the lead. The alloy is kept in a melted state for two hours, and constantly stirred. The mass is then allowed to cool, and a thick scum forms on the surface. This scum is a mixture of zinc, lead, and silver, and after being removed to a furnace and exposed to a dull red heat for some time, to drive off the zinc, is cupelled in the ordinary way. The lead is further purified by having billets of green wood thrown in while the lead is in a liquid state. A considerable quantity of gas is generated, which gives a singular aspect to the pot of molten lead. The bubbles of gas arising and taking fire at the surface present the peculiar appearance of a blazing liquid. This was the process as we observed it at Frederickshütte, but we were informed that at some works steam is driven into the melted lead, instead of adding green wood. The advantages of this over the English Pattinson process are in cheapness, the better quality of lead, and in the higher state of concentration of the mother liquor to be cupelled. The Pattinson process does not profitably admit of concentration to more than 500 ozs. to the ton, while in this process it usually reaches 1000 ozs. It seems this method was patented in England some years ago, under the name of Parke's process. It appears matter of surprise that this plan has scarcely yet been adopted in this country. We understand that Dr. Percy intends to give a full description of this method of refining silver in the edition of his forthcoming new work on Metallurgy. The advantage of this method in requiring fewer workmen is one that appeals even more strongly to the English smelter than to the German, though, on the other hand, zinc will be cheaper with them than with us.

The charges for the furnaces around Rammelsberg were given as follows:—21 cwts. of ground ore, 11 cwts. of siliceous slag, 4 cwts. of lead slag, and 36 cwts. of charcoal. The blast is applied, and the reduced lead falls into the hollow of the hearth, while the slag is skimmed off by ladies. The amount of sulphur in these ores is so considerable that though they are roasted in heaps previous to being brought to the smelting-works, it is yet needful to add so much slag to prevent fusion of the ore until the chief part of the sulphur is driven off. North Germany raises 169,000 tons of lead ore annually, and manufactures 40,000 tons of metal. Of this the greater part is sold as pig-lead, but about 800 tons of it are sold in the form of sheet-lead. The produce of silver, chiefly from the ores of galena, is 148,689 lbs. troy in the year. The lead mining employs 15,784 hands, and the metallurgic refinements as many more.

"NOTES ON CONTINENTAL MINING."

SIR,—In the columns of the Journal of Aug. 13 there appears a letter from Mr. Parton, calling attention to the series of articles having for their title "Notes on Continental Mining." To these sketches he chooses to take exception, and finds that a great portion of the information in the articles on the "German Coal Fields" and the "Belgian Miners" is before him in print. From this he deduces his charge of plagiarism; and declaims, in no measured terms, against such "cookery and literary deception." In referring to the first of these sketches, "German Coal Fields," did Mr. Parton expect that a brief *resumé* of the leading facts of the coal-producing districts of Germany, preparatory to giving detailed descriptions of places visited, should be anything else but a compilation? Is it possible that any article should be written on that subject of which we might not say, "the greater part of the information already existed in books?"

The second article, on the "Belgian Miners," it is insinuated, has been copied from "a foreign work in the French language . . . In which is contained the sum and substance of the article." We have not the most remote idea to what work allusion is here made, and whose title is so mysteriously and so periphrastically concealed. It has never been our pleasure to see any treatise on this subject, nor are we aware that any similar sketches of the habits and manners of the Belgian colliers are published. For the particulars of the Aix-la-Chapelle district we are indebted to a private communication from Herr Max Braun, engineer-in-chief of La Vieille Montagne; and for information on life and habits in the other parts of Belgium to personal observation.

Your correspondent further implies that facts or sentences have been extracted from Prof. Smyth's "Coal Mining." To this implication we can only answer that we have not seen Prof. Smyth's volume for eight or ten years past. Next, Dr. Ure's Dictionary is spoken of. In writing these articles, up to the date of your correspondent's letter we had never consulted Dr. Ure for any fact or statistics whatever. But if it were so, it is time Mr. Parton knew that when statistics are published to the world, and subsequently copied from book to book, there is no longer an impropriety in any person referring to them without quoting the authority. Is it that Mr. Parton supposes we have counted the 120,000 colliers of Belgium, or measured the total thickness of the measures at Saarbruck, to vindicate our right to embody these facts under the head of "Original Correspondence?" Yet another work is announced as having been the basis of sundry portions of these articles—Mr. Samonin's "Mines and Miners." We, indeed, perused this book with interest before visiting the scenes described, but that no single fact, process, or even statistical statement, which is not common to other books, will be found to have been transferred from Mr. Samonin's work to "Notes on Continental Mining," we may safely leave to the judgment of those of your readers who possess the book, and have no interest in making groundless statements.

It is but fair to enquire into the underlying spirit of your correspondent's letter. And here we are left a little at sea as to the nature of the obligation that has fastened the onus of attack upon him. But after looking up "all possible information as to the geological and mining particulars of the continental coal fields," which Mr. Parton modestly enough states he did, we are invited to believe that, purely from motives of outraged literary morality, he has felt himself called upon to become the champion of Virtue and M. Samonin! It would be very easy to show, and you, Sir, we believe, are already aware, that there exist other and less worthy reasons for this disingenuous attack; reasons which it would as ill become the columns of the *Mining Journal* to describe as it does a Fellow of the Geological Society to cherish. It is one of the easiest things in the world to cast aspersions, of too vague a nature to be grappled with, but yet of sufficient body to leave a sediment behind. Of this class is the remark at the close of your correspondent's letter about "going out of one's sphere" to write articles. If this statement means anything, it must imply that something has been attempted for which there was no fitness, and, therefore, it has been badly done—in fact, that the articles ought to have been written by one who had looked "up all possible information as to the geological and mining particulars of the continental coal fields;" in which case they would, of course, have been perfectly free from the slightest tinge of plagiarism. We have yet to learn that real greatness is compatible with the harbouring of petty jealousies; and, least of all, with the wanton utterance of ill-natured criticism. VERITAS VINCIT.

Aug. 27.

LEGISLATION FOR ENGLISH MINES.

SIR,—You very justly remark that it was generally anticipated at the commencement of the year that the parliamentary session of 1870 would be of momentous character, and of vital importance to our mining community and our chief trades and manufactures, but we now find the session is brought to a close, and but little has been done. At the commencement of the next session these matters will again be brought forward, and with your kind permission I beg to make a few remarks on the same.

My 35 years' experience in mining, both at home and abroad, convinces me that the Mines Regulation Bill in its present form is not equal to the requirements of the period. We want in England a general mining law, a law dealing with all classes connected with mining. Should the present Bill become law, the mine adventurer, mine agent, and working miner will be bound to work according to the rules and regulations contained therein. This is very well as far as one side of the question goes, but to do justice on all sides relative to mining, the lords of the minerals should also be bound by that law as well as the mining adventurers. The dues or royalties on all minerals throughout Great Britain, and the general conditions for mine leases, should be fixed by legislation, and until that is done the mining laws of England will not be equal to that of other nations.

Looking at the great competition the English miners have at this time to contend against from foreign countries, I consider that after a fair value is paid for land drainaged or occupied at surface, the dues on minerals ought not to exceed 3½ or 4 per cent.

There is no question but that the London Exhibition in 1851 tended greatly to open the eyes, and stimulate foreigners on many matters, but more particularly in the production of minerals; hence we find our neighbours on the Continent, and almost every other civilised nation, doing all in their power to facilitate and encourage mining, which is truly the mainspring to all other industries.

In most countries on the Continent the dues have been reduced from 10 or 15 per cent. to 2 per cent., and also laws relating to patents and other matters have been much altered in favour of the miner, while in England little or nothing has been done, therefore the British miner of the present period is not placed on a fair footing to compete with his fellow-workmen of other countries.

We find during the last few years that poor rates and prison rates in England are greatly on the increase, which is a true sign that much poverty exists among the working classes; but let Parliament fix the dues on all minerals at (say) 3½ per cent., and at the same time that no mining property should be allowed to remain idle if other parties would work it, and the English taxpayer would soon find his taxes reduced. There are tens of thousands of English capital speculated in foreign mining annually, which gentlemen would gladly invest in home mining if reasonable terms can be obtained from the lords of the soil. The mineral resources of Great Britain are very great, and there is no want of capital to work the same. All that is wanted is that the dues or royalties should be fixed somewhat in reason with that of other countries.

It is a great pity that thousands of our best workmen should so often be compelled to seek work in foreign lands when means can be so easily provided to give them employment at home, much to their own benefit and the welfare of the whole nation.

By way of comparison, let us look at Prussia. Twenty-five years ago mining in that country was but little, and the inhabitants generally poor, but through alterations in her mining laws, and reducing the dues to 2 per cent., her mineral returns are vastly increased, all her workpeople are fully employed, and she has without question become a great and powerful nation.

Since the present Government have been in office they have done much for Ireland, and let us beg that at the next session they may turn their attention a little more to the reform so sadly wanted relative to mining, for by giving more freedom and encouragement to mining enterprise every other trade throughout the kingdom is sure to be benefited thereby. AN ENGLISH MINER IN GERMANY.

Cologne, Aug. 28.

THE DANGERS OF BLASTING.

SIR.—I saw an account of a sad accident occurring to two miners, named Williams and Thomas, of Camborne, at Dolcoath Mine, from the explosion of gun-cotton, which they were in the act of tamping. Having from time to time seen accounts of several such misfortunes taking place at this mine, I venture to suggest to the respected manager of Dolcoath that he should compel the miners to fire guncotton in cases, with a wad of hemp or tow placed on the top. This kind of case I find is made by a Mr. Copeland, who invented it, and a

safety-cartridge for the prevention of premature explosions in tamping. Blasting has not met with the care and attention that it should, considering the large number of men connected with it. I have made enquiries relative to the different modes adopted for blasting, and learn that Mr. Copeland has a Patent Safety Cartridge, which ensures the miner from premature explosion in tamping, besides other advantages. I believe the same gentleman manufactures an improved waterproof case to supersede those made with paper and grease. I am sure the subject demands the careful attention of mine agents, who are responsible for the welfare and safety of those in their employ. In conclusion, let me add that gun-cotton is more prone to premature explosion than gunpowder when confined.

Cornwall, Aug. 29. OBSERVER.

THE PATENT "PROTECTOR" COLLIERY LAMP.

SIR,—Having now perfected the new Colliery Lamp, I shall be glad if you will afford me a little space in your valuable Journal to draw the attention of all colliery proprietors and managers to its advantages, and can only hope to do so in this manner, particularly at a time when the public attention is so constantly being drawn to deplorable accidents arising from the use of naked lights.

Many arguments are advanced as to what perfection ventilation and management can be brought, but, unfortunately, they do not entirely prevent these sad accidents. Some little place may have been omitted by the fireman, and gas be lodged there, or sudden outburst of gas. A fall of roof may occur, and allow the gas to find vent, and certainly under the most unexpected circumstances, that ventilation has not provided for, and which was impossible for the manager to have foreseen. Nor can they prevent the carelessness and recklessness of the collier. One thing I think everyone will admit that—first, if the mine is well ventilated; second, blasting with powder be done away with; and, third, nothing but safety-lamps used, we should seldom hear of loss of life by explosions. Of the two former means of safety I can offer no opinion, and particularly as to the second, although from the interest you take in the new cutting-machines I have little doubt may be the means of having them more generally used, and that eventually some machine will be perfected that will do its work to the satisfaction of all parties. Respecting the colliery lamps, you will, I think, agree with me in saying that whether an explosion is caused by a shot, the same effect would be produced by a naked light, and, therefore, why should not safety-lamps be used entirely? I find only two reasons—first, the lamp does not give light enough; second, the lamp is not so handy as a candle.

Many different opinions exist as to the advantages of one lamp over another, as to whether the Davy, Clanny, or Stephenson lamp is best. Experiments point to the improved Stephenson as being the safest, and that the light is extinguished before an explosion could take place: the test it stood at the Barnsley Oaks Colliery clearly proves this fact.

Mr. [illegible] Baker, in his address to the mining engineers, as reported in the Supplement to the *Mining Journal* of Aug. 13, stated that the term safety-lamp was a misnomer. No lamp yet invented was perfectly safe. And although Mr. Hyde drew your attention, in the following week's Journal, to his new Alarm Lamp, which, as he explains, is not intended to light the miners whilst at work, but as an indicator; and to such a lamp, which is very much to be admired, the remark above could hardly be said to apply, nor to the one I am about to refer to, Mr. Baker not having had an opportunity of seeing it. From the many causes I have seen and had pointed out to me, I am much of the same opinion. The lamps in use of any kind are likely to be tampered with, and miners will openly state that you cannot bring a lamp locked without their being able to open it. It does seem probable that if a lock, which must be simple, and alike, when several hundred are used, can be made by one man, another can make a key. Why do men open their lamps? In some cases to light their pipe, but more frequently because the light is so bad, or the wick will not work properly, or to snuff the crust from the top of the wick, and occasionally through sheer recklessness and mischief. One way of avoiding this is to give the collier such a light as will do away with the necessity of tampering with the lamp, and to have a self-extinguishing lamp in the action of opening it. A miner can light his pipe through the gauze of a Davy, and very often through a Stephenson. In doing so the flame must be drawn or sucked through the gauze. The lamp often gets clogged with oil, and this, again, allows the flame to pass the gauze more readily; and oil on the gauze in a dusty mine will catch the fine particles of coal dust. The light inside, coming in contact with the gauze, will cause it to flicker. The lamp may in time become so that the screw of three or four threads is so worn that the bottom will actually drop from the top, or gauze part. The pricker-hole in time will wear sufficiently large to allow the flame to pass, and other causes may be given to prove the truth of the remark made by Mr. Baker.

All these causes of accident are entirely prevented in the "Patent Protector Colliery Lamp," by means which I will try to point out. That when once adjusted the lamp cannot be opened without the light being previously extinguished. The light can be regulated from the required size to the smallest blue flame, and *vice versa*, with the greatest ease and certainty. The regulator is self-acting, and cannot get out of order. No spring or pricker is used or required. Double the light of any lamp now in use is obtained at one-fourth the cost. The wick does not cake at the top, and will not consume until the lamp is exhausted. Will burn with less ventilation than any other lamp, and is more sensitive to the presence of gas. No miner can light his pipe from it, or tamper with the light in any way, and when given into his hands could not improve the light. The lamp gauze does not become smoked or dirty, and the light is clear, steady, and brilliant, and the exterior perfectly free from oil. It has been tested constantly, both in mines and above ground, in various ways, with the greatest success, and as yet not one single objection has been raised against it; and I feel sure that many of your subscribers and readers, who could have no knowledge of the lamp except through this letter, will be interested to know that a perfectly safe lamp can be obtained, that will give double the light of a candle; to burn 60 hours, at a cost of 3d., burning any required number of hours without interfering with the wick, will see it to be their interest to follow out the suggestion you made a fortnight since. I freely invite attention to this lamp, and will gladly offer anyone who may wish the opportunity of testing its efficiency. I trust that the nature of this communication will prove a sufficient apology for trespassing so largely on your space. W. E. TEALE.

Mark-lane, Manchester.

PUDDLING BY MACHINERY.

SIR,—Reference is made in last week's *Mining Journal* to a new invention (?) introduced at the Cincinatti Railway Iron Works, by Mr. Samuel Danks, for superseding hand puddling by the use of a revolving puddling furnace machine; but I think most of your readers will acknowledge that machines of this character have long been known in England, although upon practical trials they have not proved so successful as could be wished, even in the hands of so eminently competent a man as Mr. Menelaus, of Dowlais, as to one kind of machine, and by equally energetic men for the other, for I should state that there are two distinct sorts of revolving puddling-furnaces known in England.

The revolving furnace tried by Mr. Menelaus was a cylindrical machine that originated with Messrs. Walker and Warren, many years ago, and this really seems to be the most rational form of machine, for without the use of rods or rabbles of any kind the movement of the iron, such as it receives from the hands of the puddler, is easily obtained. In fact, it seems to me that the machine ought theoretically to give a more homogeneous metal than is made by hand, and the only difficulty seems to be the heating and rotating of the furnace. In practice, however, the results promised by theory are not realised, but I do not know why. Perhaps the metal, when melted, moves like a body of water, and thus escapes the proper amount of agitation; although it moves about in the furnace, the various particles of metal do not continually change places with each other, as they do in hand puddling. How far this would be remedied by giving the cylindrical chamber a simple rotatory motion, increasing the height of the corrugations, so as to secure the continual turning over of the metal, I do not know, nor do I know whether by increasing the height of the corrugations the difficulties of getting the ball out would be an inconvenience, though I should think that this could be provided for by furnishing the cylinder with trunnions, so as to upset it when the charge was ready to draw. These, however, are mere matters of detail, which would cause no insurmountable difficulty, provided no other exist.

The second kind of rotating puddler I have seen was formed on the principle of the mortar-mixing machine—that is to say, a rotating trough, with fixed stirrers, or the equivalent of a movable furnace with fixed rabbles. By varying the form of these rabbles, the motion of hand-puddling could very readily be imitated, but then there are the questions, how is the iron to be kept at a uniform temperature, and what will be the wear and tear of the rabbles? I do not believe that the first of these questions has been much gone into, because the second was found to offer an almost insuperable difficulty. Cold water was taken through them the same way as it is taken through tuyeres, but there still appeared to be a great tendency to melt, and I have not heard that the invention, which I think was patented by Messrs. Yates and Tooth, has ever proved a commercial success.

So far as I have been able to judge, the cylinder machine appears to promise greater success than the trough machine, but the absence of the stirrer from the former appears to be an objection at least to some extent; but I believe that if the cylinder were made somewhat longer, and the interior surface made somewhat uneven by the insertion of a ring of fire-clay cones about midway between the two ends. As the slag is always much more fluid than the ball, I should also be inclined to try whether the slag could not be drawn off a couple of minutes before withdrawing the ball, so as to give the cylinder a few turns more to, as it were, cleanse the iron before subjecting it to further treatment.—*Dowlais, Aug. 30.* F. F.

FAN VENTILATION—THE GLASGOW MEETING.

SIR,—I must beg you to favour me with a few lines of your valuable space, in order that I may correct one of the errors in your report of the discussion on Mr. Morison's interesting paper on Fan Ventilation, read at the Glasgow Meeting of the North of England Mining Engineers, and reported in the Supplement to last week's Journal. I am stated, in one place, to have said that some experiments made by the late Mr. J. J. Atkinson were valueless. What I did say, and I believe the meeting clearly understood me, was exactly the contrary. I expressed my surprise that a gentleman who had quoted Mr. Atkinson as an unexceptionable authority so long as his experiments tended to prove the value of *one* description of fan, should declare that some published experiments (quoted by myself) to which his (Mr. Atkinson's) name was attached, as well as other well-known names, were valueless when they tended to prove that *another* description of fan was of equal value.

Blenheim-terrace, Leeds, Aug. 31. ARNOLD LUPTON.

THE TRUCK SYSTEM.

SIR,—It has been suggested by a French inventor of considerable experience that the best mode of diminishing the loss of life in collieries is to place instruments in their hands which will make accident impossible, even with their present carelessness, instead of attempting to make them careful. Thus, he proposes a safety-lamp which is absolutely inexplosible, and as he hears of smoking in the pits he would give them a pipe which will permit them to do so with perfect safety, and would permit them to light their pipe with their safety-lamp, in order to remove the inducement to carry matches. Of course Mr. Nadal, for that is the inventor's name, would prefer good ventilation in a colliery for the comfort of the workmen, but for their mere safety the present imperfect system might be continued. I would suggest a similar remedy for getting rid of the evils of the truck system. That the truck system has some evils cannot be denied, but it has also some enormous advantages, which appear to be entirely overlooked by all except the wives of the colliers. The effect of the truck system is frequently to secure food and raiment to the wives and families of the colliers, instead of permiting the whole of their earnings to be expended in drink; and it does not, therefore, appear to be unreasonable to suppose that some modification of the truck system could be introduced which would be alike to the advantage of the workman and his family.

It is an indisputable fact that, taking three working men out of four, even of those who receive their wages weekly, and including all trades, they are so utterly improvident that they are quite without money before another week's wages become due, many being positively without a shilling on the Monday morning, although they have received good wages on the Saturday previously; they are thus reduced to the necessity of either starving themselves and families for the rest of the week, or borrowing to supply their immediate wants. A more despicable class of individuals than this can scarcely be conceived; yet those who form it are the first to complain of the amount they earn, and the first to expect assistance when in difficulties. To regard such individuals as men is scarcely justifiable; and it would, perhaps, be best for themselves and for the general good to treat them as irrational beings, requiring the same amount of care and attention as are given to favoured domestic animals. A modification of the truck system might, at least to some extent, place them in this improved position.

The great evil of the truck system, as it has hitherto existed, has been that its administration has been in the hands of the employers, and these are even less worthy of being entrusted with power than their workmen, because the leading object of the master is to utilise those he employs for his own advantage, much in the same way as he utilises his other machinery and plant; though he has less care for the workmen than for the machinery, because the one can be replaced without cost, whilst to replace the other will necessitate an outlay of hard cash, and a consequent diminution of his income. The truck system, to be effectual should be beyond the control of either master or workman, recognised by the general laws of the land, and arranged for the mutual convenience of employer and employed. The only important question is—Can these propositions be practically realised? I believe they can.

In the first place, we may assume from the continuance of the truck system in the face of stringent Acts of Parliament against it that masters are not averse to making advances to their workmen, and that workmen are desirous of the accommodation which the truck system affords; and, secondly, that as we cannot stop the practice of the system we had better legalise it, with such modifications as shall make it really valuable. Masters should be permitted to issue advance tickets at the end of each day for not more than two-thirds of the wages estimated to have been earned by the workmen receiving the advance; and the master should be compelled to pay for the ticket on the following pay-day, no matter who should present it. By keeping a stock of shilling advance tickets prepared the issue of them would give little inconvenience, and, were certain restrictions imposed, they would be a great boon to workmen. It should be made illegal to purchase intoxicating drink with an advance ticket, and any tradesman accepting such ticket as payment for intoxicating liquor should be made to pay a penalty of forty times the amount of the ticket so received, one-half of the fine imposed being payable to the informer. As these arrangements would prevent the application of advances for the purchase of drink, and at the same time enable the workman or his family to purchase necessaries at any shop in the neighbourhood, their social position would be much improved, and even the improvident would be secured comforts which at present he either cannot get or is made to pay too dearly for.

The objection to the truck system, that the workman is not free to purchases where he pleases, would no longer exist; the objection of the master, that he cannot advance cash because it would be expended in drink, which would render the workman unfit for his work on the following day, could no longer be raised; and, as every man would have at least one-third of his earnings to receive each pay-day, there would be nothing to prevent him getting thoroughly drunk periodically, should it please his taste. H.

Sept. 1.

COPPER MINING IN LAKE SUPERIOR.

SIR,—I am sorry to say all the information I can give you in regard to copper mining in that region is of a discouraging nature, and the country is becoming rapidly depopulated. Of the 35 mines in active operation at the commencement of 1869 but seven are employing a full complement of men, a few others are picking out what copper there is readily obtainable, and other few are working on tribute.

The failure of many of these really valuable mines is practically attributable to the low price of copper, and the high rate of wages consequent upon the cost of living, but mainly to the extraordinary richness of the Hecla and Calumet Mines, which are together producing an average of over 700 tons ingot copper a month. These mines (about to be consolidated) have about one mile length of vein, averaging from 6 to 12 feet in width, and of very uniform richness, the yield being about 1200 lbs. ingot copper to the cubic fathom of rock as taken from the mine. As the mining cost is no greater than that of their neighbours, who produce about one-third that quantity, you can realise the difficulty of competing with them. They are at present paying quarterly dividends of 5*l.* per share, and with two others, the Quincy and Central, are the only dividend-paying mines in the country. The formation is very singular, being a dark brick-coloured conglomerate, thickly interspersed with pebbles of jasper. There is no mass copper, but some of the vein is so rich as to be smelted without stamping, yielding as high as 30 to 40 per cent. pure copper. The rock stamped yields about 5 per cent. It is a singular fact that the vein has not been found on either side of these two properties to be remarkably rich, although the Schoolcraft, to the north, is working with some show of success.—*Boston, U.S., Aug. 16.* C. E.

SCIENCE IN MINING.

SIR,—It is with the humblest apology that I send you a letter under the above heading, which (with a full knowledge of the general ignorance on the matter) at first sight I have no doubt you will consider satirical; but I do so for the purpose of calling attention to the mistaken ideas of your correspondents, "F. G. S." and "Old Miner," in last week's Journal, and of trying to show in what an unhappy state of blindfoldness we are at the present time. To prevent any mistake, I will here state that I exclude from these remarks all improvements with regard to mechanical science, which have been so great and useful during the last few years. Mechanical science is not "science in mining," although the results deduced from mechanical science may be, and often are, applied with advantage to the results which should be deduced from *science* in mining, but really are deduced from *experience* in mining. To explain further what is the real meaning of science in mining—of which we are almost, if not wholly, ignorant—"Science" is a knowledge of the absolute certainty of the truth of some fact (perchance hitherto unknown, in consequence of it being unavailable for practical tests, or some other cause) by a system of either inductive or deductive reasoning, in the former of which you proceed from a known law or visible sign, and step by step pile up result on result until you arrive at the information which is valuable; and in the latter, having a knowledge, through experience, of the final result, you find the *immediate* cause of that result, and continuing a backward system of argument arrive at the *prime* cause. In mining the scientific should consider themselves highly favoured, for they have the advantage when the *a priori* line of reasoning fails of trying to meet it half way *a posteriori*, and yet in no pursuit has experience done so much and science done so little.

It seems that there is as little probability of men of science ever being able to demonstrate with any degree of certainty the presence, position, quantity, &c., of minerals, as of the mathematical school presenting to the world the circle squared. Does it not seem a disgrace to science that the enquirer after knowledge is compelled to pass by its most assiduous devotees, and seek his information from the empirical laws of an unscientific miner? Experience has shown us that various metals are extracted from the earth—that their associations are complex and multiform—that certain ores are commonest in or near certain stones—that particular minerals usually keep company with the more valuable gold and silver—that the contents of a cross-course often vary from those of the lode—that an intersecting lode heaves the intersected—that bunches of ore may be expected where two lodes intersect—that parallel lodes may usually be expected to bear ore under similar circumstances—these and hundreds of other facts, I say, experience has shown us; nevertheless, with all this knowledge of facts, almost unvarying, science has been unable to set before us any satisfactory proof of the laws which govern results so remarkable and so valuable. Could your correspondent, "F. G. S.," have informed us of the general nature, geologically and mineralogically, of all the outward and extraneous conditions of the Old Treburgett Mine, and then by a satisfactory proof shown us that such and such being the case, such and such would necessarily follow, and thus establish a position that must meet with attention and carry conviction, all would have been edified by his remarks, and none would have been found to cavil at his assumptious heading; but such being impossible, the subject had better been left alone, and the latter part of his letter taken the place of an advertisement in the usual form.

The absurdity of introducing improvements in mechanical science as a peculiar reason why a certain mine has advantages over others, is such a monstrous exhibition of weakness of argument as to require no comment. Every improvement in mechanics affects all alike, and the shareholders in the Old Treburgett Mine will gain no more by them, and will be affected far less by them, than the common miner whose labour is saved. "Old Miner," in like manner, might have informed us (if he knows) the causes and effects of the mineralogical transitions of the various substances that have produced his valuable elvan; or he might (if he could) have stated the results of a few experiments, &c., such as "Mineralogist" has done, whose letter, by-the-bye, contrasts very favourably with either of the above, though only another proof of how really ignorant we are of the real science of mining.

Permit me, in conclusion, to give one word of advice to such writers as "F. G. S." and "Old Miner." When they wish to extol any mine, let them candidly state what is the nature of the country, general conditions, &c., of the veins, in the district, the particular conditions of those in question, the effect (if possible) change in the country has on the metalliferous veins, effect of water on the veins, temperature, &c.; in cases of unusual occurrences of mineral the peculiarities, matrices, stratification, and bearing of the lode, the intersections, gradations, &c., might be plainly put forward, and the reader would have a fair chance of comparing the appearance with any others of a somewhat similar character that had come beneath his notice; and, drawing his own conclusions as to the probabilities of success, look on it in a favourable or unfavourable light as his judgment advised.

I am well aware that this is not the object of the writers of such letters as I have quoted, but there is no doubt it should be, and I am satisfied the public will not be content with general remarks and the publication of partial analyses, but prefer an honest exposure of what is behind the scenes; and if the manager does not think the appointments of his company fit for their eyes, let him come forward and make his apologies to his audience, and they, I have no doubt, will be content to sit and feast their eyes (as Artemus Ward used to ask us) on the green baize curtain, which in this instance is generally in the form of a prospectus. CHARLES THOMAS.

3, *Great St. Helen's, London, Aug. 31.*

SCIENCE IN MINING.

SIR,—Week after week the publication of the Journal is looked forward to by all those who are interested in Mining, either practically or otherwise, and the value of your information is undisputed. My object in addressing you, however, is not to eulogise your paper, but to call attention to a system of correspondence (seemingly on the increase) in which the writer, under some practical heading, makes use of a few general common-place remarks, for the sake of indulging in an unmistakable puff of some property in which he is interested. In your impression of last week there are two letters, one signed "F. G. S.," the other "Old Miner," which exactly illustrate my meaning. "F. G. S." begins by quickly putting us on good terms with ourselves, in informing us, as a fact, that we are really not quite so ignorant as we were 50 years ago. He then states three palpable truisms, with regard to our increased knowledge of chemistry, machinery, and metallurgy; and, of course, we read on, fully expecting that we are now going to reap incalculable advantages from the researches of "F. G. S.'s" scientific mind, as we had been led to suppose by the heading of his letter; but, imagine our disap-

MINING MACHINERY: TRANSFER OF POWER—WEST AND DARLINGTON'S APPARATUS.

SIR,—It is frequently an object of great importance in mining operations to transfer power from one point to another, and to render it applicable for purpose of pumping, winding, or giving motion to dressing machinery. The practical methods available for this purpose are flat-rods, the construction of which is well known, West and Darlington's transfer apparatus, the accumulator system, Hirns telo-dynamic cord, and the slow-speed endless rope, in connection with Fowler's clip-pulleys, each having a special and distinct value.

The transfer arrangements devised by Messrs. West and Darlington imparts a reciprocating motion only, but the uses to which it can be applied are so many as to ensure its adoption by pitmen and engineers. Thus the power of streams or steam machinery may be readily transferred to any point at surface or underground, without reference to lines or angles of motion, pump-rods balanced, and a connection made between vertical and underlay rods, without resorting to bell-cranks or V-bobs. Moreover, the apparatus has no moving parts other than are associated with the initial and terminal movements; nor does it crowd passage-ways, or absorb an appreciable amount of power.

These features will be rendered intelligible by the following sketches, in which Fig. 1 represents the apparatus adopted at Wheal Phœnix, in Cornwall, for transmitting power from the main to a bye shaft at the 190 fm. level; whilst Fig. 2 shows the application of two rams in changing vertical into underlie motion; and Fig. 3 a balance plunger working at Phœnix, and carrying a dead weight of 20,000 lbs. One arrangement is, in reality, but a modification of the other, the essential features being two plungers and a main of pipes, the latter charged with water, forming practically a hydraulic bar.

a, plunger attached to main-rod; *b*, pipes or main connecting the ram case; *d*, plunger, with weight-box, or otherwise the pumping-ram, set with inclination of lode; *g*, guide for weight-boxes; *h*, pipe communicating with cistern for supplying such water as may be requisite to make up leakage; *J*, small supply plunger, which may be attached to the apparatus when the pipe, *h*, cannot be advantageously introduced; *o*, self-acting valvular arrangement, which may be substituted either for the supply pipe, *h*, or plunger *j*.

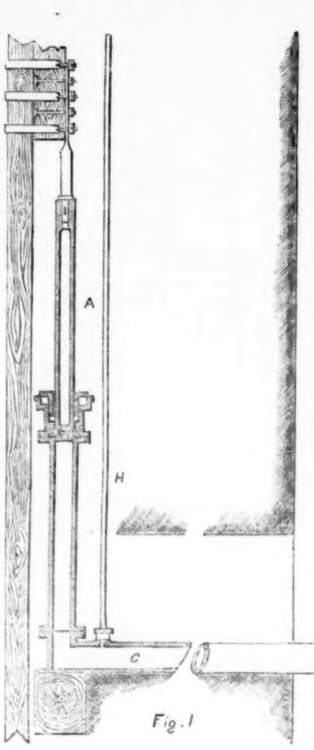

Fig. 1

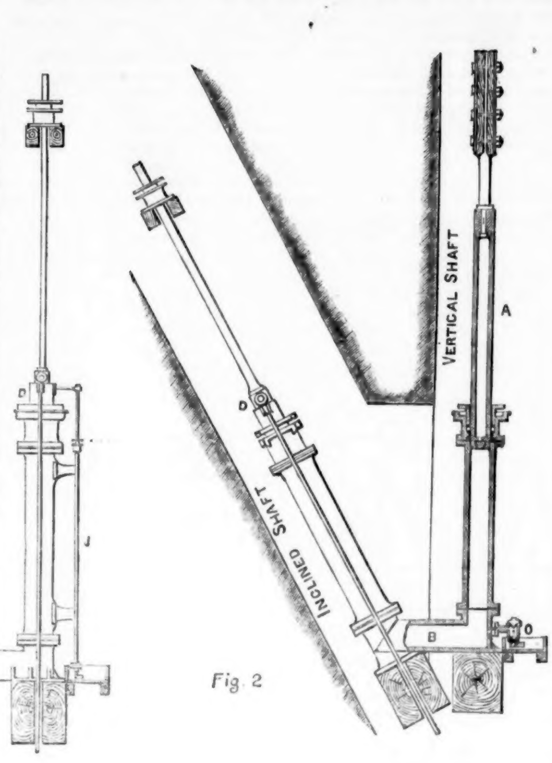

Fig. 2

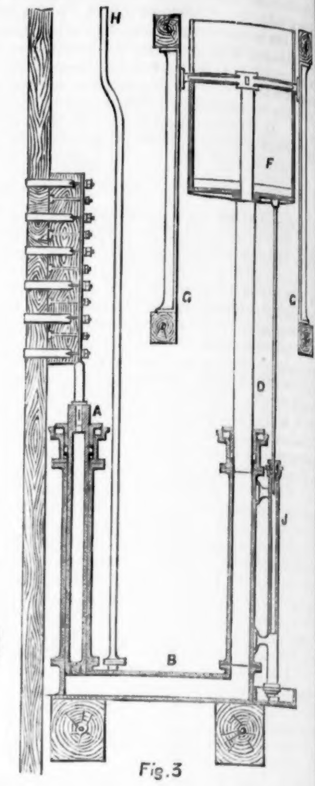

Fig. 3

The following brief particulars of the transfer arrangements employed at Phœnix will be interesting:—Water main placed in a very crooked level, having four right angles, besides a great many other turns; length of main, 100 fathoms; diameter of plunger, 7 inches; length of stroke, 8 feet; diameter of lifting-pumps at the end of apparatus, 7 inches; length of columns of the lifting-pumps, 18 fathoms; cost of maintainance limited to grease and packing for the rams; time in work, eighteen months. With this apparatus the agents having the conduct of the mine were enabled to divide the ground at the 190 fathom level, so as to make *seven* distinct drivages at one and the same time, which resulted in rendering some highly valuable tin ground available in four-fifths less time, and also in saving many thousands of pounds in dead and pumping charges, which must have been sunk if one fore-breast only had been driven. The pressure within the water main at Phœnix is comparatively small. In general cases 250 lbs. per inch may be resorted to; thus a 7-in. pump, 20 fms. long, may be worked by rams, and a main 4 in. diameter. Several pumps, if needful, may be placed on the same main. In such a case it will follow, however, that the one representing the lightest load will be first moved by the actuating plunger, whilst the one carrying the heaviest lode will rise last. The advantages which this transfer arrangement offers to the miner may be further noted. Steam pumping-engines need not be placed underground, but at surface, and the entire unit of power transferred by a simple main of pipes and a couple of plungers. The reciprocating movements are unaffected by the position of the cylinders, which may be placed at any angle best suited to the special exigencies of the situation; the pump-rod is never subjected to side or vibratory movements, consequently it can be permanently and properly guided. The main for the retention of water may be buried or carried down the corner of a shaft, and into the most distant headings, without causing the least inconvenience.

As moving parts in no way differ from ordinary mine plungers, the action of the apparatus is equally simple and certain. X.

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pointment—"The Old Treburgett Mine contains every element of success!" Yes, we have positively waded through twenty or thirty lines of puerile facts to arrive at this unsupported statement. Why, while on the subject of "Science," if he must refer to the Old Treburgett Mine, does he not enter into some particulars with regard to the stratification, matrix of the lodes, &c., so that a fair opportunity might be given to his reader of comparing the particulars with those of Ludcott, North Dolcoath, and others, which promised so much silver, and produced so little? The whole thing is an undeniable ill-concealed puff. Would it not have been better to have published an advertisement, as follows:—

SCIENCE! SCIENCE!! SCIENCE!!!—Science is ever developing new and important facts in chemistry, machinery, and metallurgy. Try our far-famed "Old Treburgett Silver-Lead Mine." Beware of all spurious imitations.

"Old Miner" adopts a different style, but with the same object. To impress his readers with his thorough acquaintance of the mining district he introduces a Cornish proverb or two (apparently somewhat regardless of their application), and then indulges in quoting a phrase of Juvenal's (rather hackneyed, by-the-bye), in which he drops a tear of regret over those who will pander to their unwholesome appetite for scribbling. We also could quote a proverb which has some reference to glass houses and stones, but seeing the homely signature of "Old Miner," we pass over literary eccentricities, and hope to gain some real practical information; but, as in the case of "F. G. S.," we are lamentably disappointed. "Tin is in elvan, therefore the Terras Tin Quarry should not be contemned because it is an elvan." After half a page of generalities, he exposes his hand, and exhibits to our view the Terras Tin Mining Company. As far as we are able to judge from the superficial information afforded us by "Old Miner," the Terras Tin Mine exhibits the same features almost in every respect as the hitherto unfortunate Hammett Mine. And here, to give even "Old Miner" his due, we take the opportunity of fully endorsing the applicability of the Cornish proverb which he quotes with regard to Terras—"What won't make tin will take tin." We know as a bitter fact that its prototype Hammett, though unable to make tin, has been anything but backward up to the present time in taking tin. Let "Old Miner" take the advice we have given "F. G. S.," and if he wants to advertise, advertise. Wishing to be impartial, we submit the following to his consideration:—

PREJUDICE! ENVY!! IGNORANCE!!!—FORTY-FIVE YEARS' EXPERIENCE.—All persons suffering from the fearful ravages caused by the dissemination of either of the above will find immediate relief by applying to the Terras Tin Mining Company—one trial will suffice.

"Old Miner" concludes by calling upon his readers not to heed what Prejudice, Envy, and Ignorance may advance. We, therefore, do not expect him to heed our remarks, for we confess ourselves *prejudiced* against all such correspondence, *envious* of any man who could be satisfied having written it, and thoroughly *ignorant* of any advantages to be gained by its perusal. Others, however, may be deterred from wasting time over reading these pseudo advertisements, and if so it will amply repay— C.

London, Aug. 30.

SILVER MINES IN CORNWALL.

SIR,—I am not over sanguine respecting English silver or gold mines, although I discovered the first silver mine ever worked in Calstock, over 60 years ago, when I was only 12 years of age. I was then what is termed a barrow-boy, with not enough work to keep me on, and I began to open a narrow place in my road, and came on a branch of silver, which I took away in long wires, and wrapped around my hand. The mine belonged to Messrs. Williams and Fox. Shortly after Michael Williams, the elder, was sent to assay all parts of the lode, to prevent any being thrown away. I had to attend him, keep his fire, bruise the samples, and watch the pot, and often had to empty it. This I continued to do as long as he stayed on the mine; and I learned to assay the samples when mixed as well as he could. Thus, your readers will see that I knew silver, and how to assay it, a long time ago.

I worked seven years on these silver lodes, and I opened on every one then known between Pengelly Cross and Honeycomb House. I have raised silver from lodes for nearly all the distance, the largest deposit found being a little west of Harrowbear Farmhouse, Callington: they smelted some ore there.

I am bound, in fairness to the mining public, to say openly that every legitimate adventurer I ever knew or heard of came out of these mines minus his cash. The silver ore was very good, and had the workers in early days selected the best portions of the lode and gossan, and sent them off without dressing, it would have paid better. No one would, however, buy it until dressed. Messrs. Lucas and Sure were the first to purchase it in the undressed state, but they soon became bankrupt.

I have seen 500*l.* worth taken out in a few days, and no more found of value for months. The evil was that it was small in quantity. The country for the time could only be compared to the first find of gold in California. Water-wheels and steam-engines were erected at once, no money was wanting if you could get a grant. But it all ended in smoke. In fact, I do not believe that a single mine of the lot ever paid a genuine dividend. The mines after this lay dormant for years; then Mr. Malachy made his appearance. He was well known to be a shrewd fellow, but he had to live by his wits. At the time two or three men were driving a cross adit to cut a portion of the lode; they cut it showing silver. Malachy looked at it, and arranged with them for their rights. He drove on for a few days, and found a nest of silver. He then took a sleeping partner, who knew how to manage matters: they sold five or six shares cheap. It was said that this partner booked ten times as much silver ore as sold than was raised. From this they declared a high dividend at once, and handed over the cash to the five or six persons who owned shares. These men needed no trumpeters. Malachy disposed of his interest at once, at, I may say, fabulous prices. I am not aware that they ever found a second nest of silver, and the bubble burst. Lucas and Sure also found that they had been so tricked in the samples of ore they had purchased that they became bankrupt; and this mine also vanished in smoke, as others had done before.

I may here remark that I have seen many a curious prank played off by these silver mine promoters. If a man has a few pounds at his disposal, or can find a simpleton who has money, or sureties that he can draw on, he can take up a mine, particularly of silver or gold, purchase good ore, and get it conveyed to the mine, and even to the market; make a sale of it, and on this declare a dividend, and at once sell out for a large sum, leaving the last holders to seek their remedy. The art is in blowing the bubble, and keeping it up until they clear out, but it often bursts before they do so.

It is well known that keen Yankies have purchased parcels of good ore, and taken them to the mines, for the express purpose of catching English simpletons. One was a little wider awake: he sent a first-class surveyor to inspect, but they deceived him, by showing him the ore mixed with the rocks, and he reported it all right. A second man was sent, who examined the place, and discovered that there was no lode, and no ore more than had been brought there. I have had a dozen of these tricks attempted to be played off on me, and some of them very cleverly done.

I never meddle with a mine where an early dividend is attempted to be shown off: if it be as they attempt to show, let them work it quietly, and pocket the cash. Those who attempt to show early dividends may be known even to an ordinary simpleton, as they are expert trumpeters, and keep a number of others on the look-out to blow when they see a chance.

I would ask who put up the last engine on one of the silver lodes west of the Harrowbear Farmhouse? Has the captain now by him his own and many other reports got up to start that engine? If so, they will show the extraordinary quantity of silver and copper they all but guaranteed to raise. He may as well say what they did raise, and if the mine was like the others, and ended in like manner, by the bursting of the bubble? I have no doubt he could also furnish the public with an account as to how many hundreds of thousands sterling have been sunk during the last 60 years in outlay and interest and money. I ask him to be candid, when I think he will find that the interest on money lost on capital expended to be over 300,000*l.*: this is exclusive of outlay. I may as well ask him one other question, respecting a rich silver mine near Lidford,—if he ever reported on it, and how it ended? I might ask many other questions, but I will not throw stones at a lame dog, as I know that nine-tenths of mine reports are only written to entice unguarded men.

I say these so-called silver lodes will not produce copper to pay: they are eaten out with arsenical mundic. If a chance lode be found, bearing from 10° to 20° south of east, it makes a shallow deposit of good copper, but not many of these lodes take that direction. Still I believe the district, with economical management, might be made a paying one, if worked for arsenical mundic, as it is all mixed with from 1 to 2½ per cent. of copper, and all the lodes carry tin. This, I think, has of late years been overlooked, from its being so mixed with mundic. I have myself found stones of tin nearly solid in these lodes pounds in weight, and many of these were evidently worked by the ancients, not for copper or arsenic, but for tin, the remains of old stamps bearing evidence of this. If this were looked into, I think that three mines would employ a greater number of people than those employed on them all when worked for silver only. They should make the most of all fish coming to the hook, and if nests of silver are found, take them as silver. I believe there is a very wide field open on these very lodes for working for generations to come. N. ENNOR.

St. Teath, Camelford.

[For remainder of Original Correspondence see to-day's Journal.]

BISMUTH.—Within the past few weeks there has been a discovery of bismuth in the deepest part of the Crown lode at Botallack. This mineral, by its quality of imparting hardness, is useful in the formation of several alloys. It is used (or ought to be) in type, pewter, Newton's metal, solder, and largely for electro-types. The present "find" was worth from 12s. to 14s. per lb., when smelted, and most of it was rich stuff, and is only a little bunch. The late Mr. Joseph Carne, in a paper which, up to that date, was exhaustive of the productions of St. Just, records that native bismuth had been found in two of the tin and copper lodes of Botallack, up to 1822, but that the best of the specimens for the mineralogist's cabinet had ceased, and only inferior ones were at that time discovered. The present specimens agree with Mr. Carn's description of the auriferous sulphuret of bismuth, then as now found in the Crown's lode. The miners of half a century ago, as a few weeks since, ascertained the presence of the metal by thrusting the mineral into an ordinary fire, when it oozed out in small globules.

AMERICAN LEAD MINES.—The lead mining industry of this country has been for some time declining, and was never very prosperous, except in the Western States, where the deposits of galena in the irregular caves and crevices of limestone had been for many years exploited in a rude and speculative way. The consumption of lead in this country amounted last year to 50,000 tons, of which 37,500 were imported. Of the remaining 12,500 tons, about 11,000 were produced in the West. This amount is not even sufficient to supply the demand of that section, the consumption in the West having risen to 15,000 tons. For certain purposes, moreover, especially for the manufacture of white-lead, the American article is said to be inferior, by reason of impurities.—*Engineering and Mining Journal* (New York).

GOLD OF NOVA SCOTIA.—After two years' search, Mr. W. D. Hall has succeeded in discovering one of the most promising belts of auriferous quartz and slate that has ever been found in this country. The owners of this valuable property have ample water to drive machinery, and are making preparations for the erection of a 15-stamp mill. Mining operations will probably be commenced soon. The mill will be near the Kelag River, about four miles from the junction of the Musquodoboit and Sheet Harbour roads, and 15 miles from shipping at the head of Sheet Harbour.—*Halifax Citizen.*

QUARTZ IN NEW ZEALAND.—As an illustration of the extraordinary richness of some of the quartz in New Zealand (says a Northern paper), we may mention that a few days ago, at the melting-houses of the Union Bank 30 ozs. of gold were obtained from 107 ozs. of picked stone from a Coromandel reef. At this rate a ton avoirdupois would yield 9158 ozs. troy of gold, worth 25,000*l.* sterling. The process employed was that of fusing at a high temperature the entire mass with a flux that converted the silica into a fluid glass, through which the gold sank to the bottom of the crucible by reason of its greater specific gravity.—*New Zealand Examiner.*

FOREIGN MINING AND METALLURGY.

It appears that the Styrum (German) Metallurgical Company produced last year 19,149 tons of iron in bars and rails, 6906 tons of plates, and 949 tons of pieces of cast-iron, making a total of 27,003 tons, against 24,616 tons in 1868. A very large iron bridge is about to be thrown across the Neva, at St. Petersburg. It will be about 1100 ft. in length, and will probably rest on twelve or fourteen piers. The weight of the ironwork involved in the construction of the bridge is estimated at upwards of 6000 tons.

The war checks and even interrupts in some localities the exportation of coal from Belgium, and this sad state of things will probably last some time. On the other hand, the exportation of Ruhr coal being again permitted by Prussia, Holland is now sending Belgium fewer orders for coal. The situation, then, is calculated to inspire some uneasiness. Some of the Belgian blast-furnaces and rolling-mills may possibly also restrict their production, and this would, of course, involve additional depression in the Belgian coal trade. Meanwhile, as the extraction of coal in Belgium has been somewhat moderate of late, prices maintain themselves tolerably well. The Belgian Government has not ratified an "adjudication" which took place in July at Brussels, and which comprised *inter alia* contracts for about 5000 tons of Bessemer steel rails. The contracts were secured provisionally by M. Adhemar Le Roy, representing Messrs. C. Cammell and Co. (Limited) of Sheffield, and by Messrs. Tiden, Nordenfelt, and Co., of London. The Belgian Government has now declined to ratify these contracts, but will let similar contracts instead to some Belgian firm. The Cockerill Company, at Seraing, is the only Belgian establishment which has appliances for the production of Bessemer steel, and will, consequently, in all probability receive an order for the rails in question.

The condition of the French iron trade has not changed very much during the last few days, but a general feeling of depression and uneasiness prevails. The forgemasters of the Champagne group have not slackened their production, and it is stated that they have decided to make every possible effort to avoid extinguishing their furnaces. In the Moselle district the Ars and Hayange furnaces have continued their operations, so far as it has been practicable to do so, having regard to the relatively limited number of men whom the war levies have spared for industrial pursuits. At present the blast-furnaces of this group have not been blown out. The advices received from the Longwy district are tolerably good, the works having a fair number of orders on hand; this group has benefited from its situation, and the intelligent measures taken in regard to it by the Great Luxembourg Railway Company, which has endeavoured to reduce to a minimum the inconveniences resulting from the heavy military traffic which has been passing over the local railways. White coke-made refining pig is quoted in the Moselle at 2*l.* 18s. 4d. per ton; speckled pig, 3*l.* 0s. 10d. per ton; grey refining pig, 3*l.* 3s. 4d. per ton; casting pig, No. 1, 4*l.* 4s. per ton; ditto, No. 2, 4*l.* per ton; ditto, No. 3, 3*l.* 16s. 8d. per ton; ditto, No. 4, 3*l.* 13s. 4d. per ton; ditto, No. 5, 3*l.* 10s. 6d. per ton; charcoal-made refining pig, 5*l.* 8s. per ton; rolled coke-made iron, 8*l.* 4s. to 8*l.* 8s. per ton; cast-iron pipes, 6*l.* 16s. per ton; solid columns, 5*l.* 16s. per ton; hollow columns, 8*l.* 16s. per ton. The sale is to be attempted this month of the Blanc-Murger forges, in the valley of the Semouse (Vosges); the sale is proposed to be proceeded with at Remiremont, on Sept. 8. The municipal authorities of Rochefort have been authorised to borrow 44,000*l.*, to provide for an improved water supply at that town. The supply proposed is to be at the rate of about 25 gallons daily for each inhabitant of the town. The Compagnie des Chantiers et Ateliers de l'Océan has established in the Mazeline Works at Havre a special establishment for the manufacture of locomotives and tenders. Besides having various orders on foreign account, the company is now engaged on a number of locomotives for the Western of France Railway Company. Axles of great durability are being introduced into these engines, on a principle patented by the Western of France Railway Company. An engine with these axles has been running upon the Western of France Railway for the last five years, and has run upwards of 300,000 miles without its axles exhibiting any signs of decay.

Copper has not secured a better tone upon the French markets. Up to the last few days quotations at Havre were almost nominal, but recently 10 tons of Chilian, to be delivered this month, changed hands at 64*l.* per ton, Paris conditions. The German copper markets have been rendered dull and lifeless by the war. Tin has revived upon the Dutch markets. At Amsterdam the article, very depressed at the commencement of the war, has regained a little of the ground which it had lost. Banca has risen to 75½ fls., and Billiton to 73½ fls., but very few transactions have taken place. According to the last advices from the Dutch Indies during the second quarter of this year about 46,000 ingots of Banca were dispatched to Holland, and there were still about 100,000 ingots disposable at Banca. There is some expectation that the war will occasion an advance in lead. In zinc there has been little change. At an adjudication which took place a few days since at Paris the Vieille-Montagne Company presented the lowest tender.

PETROLEUM IN AMERICA.—The petroleum yield for July was extraordinarily large, averaging over 15,000 barrels per day, being about 2000 barrels more than the running average two months ago. Three days only of this production suffices to furnish as much petroleum as the entire export of 1861 (1,500,000 gallons). Whereas more than 60,000,000 gallons have been shipped since Jan. 1, 1870. It is going to all countries abroad as usual, excepting to Germany and France. Antwerp is becoming the entrepot for Western Europe, and Cronstadt for Russian and Prussian countries. The abundant production in face of European complications has brought down the price to 22 cents.—*United States Railroad and Mining Register.*

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